AMENDMENTS TO THE CLAIMS

IN THE CLAIMS:

A complete set of claims is provided below.

1. (Previously presented)A method of data compression, comprising:

partitioning a first set of basis functions into groups, each group corresponding to a region, each basis function corresponding to one unknown in a system of linear equations, each of said basis functions corresponding to an original source;

selecting a plurality of spherical angles;

calculating a far-field disturbance produced by each of said basis functions in a first group for each of said spherical angles to produce a matrix of transmitted disturbances;

using a computing system, reducing a rank of said matrix of transmitted disturbances to yield a second set of basis functions, said second set of basis functions corresponding to composite sources, each of said composite sources comprising a linear combination of one or more of said original basis functions;

partitioning a first set of weighting functions into groups, each group corresponding one of said regions, each weighting function corresponding to a condition, each of said weighting functions corresponding to an original tester;

calculating a far-field disturbance received by each of said testers in a first group for each of said spherical angles to produce a matrix of received disturbances;

reducing a rank of said matrix of received disturbances to yield a second set of weighting functions, said second set of weighting functions corresponding to composite testers, each of said composite testers comprising a linear combination of one or more of said original testers;

transforming said system of linear equations to use said composite sources and said composite testers;

identifying a plurality of sub-matrices in said transformed system of linear equations; and

operating on said plurality of sub-matrices to solve said transformed system of linear equations.

2. (Previously presented)A method for factorization of an interaction matrix, comprising:

identifying one or more small-valued elements of an interaction matrix;

setting said one or more small-valued elements to zero;

identifying one or more first sub-blocks in said interaction matrix, said first sub-blocks containing non-zero elements;

identifying one or more second sub-blocks in said interaction matrix, said second sub-blocks containing all zero elements; and

using a computing system, applying a decomposition to said interaction matrix by performing matrix operations on said first sub-blocks.

3. (Original) The method of Claim 2, wherein said decomposition comprises an LU decomposition.

4. (Original) The method of Claim 2, wherein said decomposition comprises matrix inversion.

5. (Original) The method of Claim 2, wherein said decomposition comprises an LDM decomposition.

6. (Original) The method of Claim 2, wherein at least one of said matrix operations is performed using optimized software.

7. (Original) The method of Claim 2, wherein either decompositions of first sub-blocks for a first block row below the main diagonal of said interaction matrix are substantially computed before decompositions on a second block row or a substantial number of decompositions of first sub-blocks for a first block column to the right of the main diagonal of said interaction matrix are substantially computed before decompositions on a second block column.

8. (Original) The method of Claim 2, wherein said factorization permits direct solution of a system of linear equations and wherein said direct solution comprises the division by a pivot.

9. (Previously presented) A method, comprising:

using a computing system, generating a block-sparse matrix containing substantially full diagonal blocks and containing more than one substantially sparse block where said more than one substantially sparse block contain non zero elements in substantially similar locations; and

identifying one or more sub-blocks in said block-sparse matrix, said sub-blocks containing a plurality of non-zero elements; and

applying a decomposition to said block-sparse matrix using said sub-blocks as a sub-matrix.

10. (Original) The method of Claim 9, wherein said decomposition comprises an LU decomposition.

11. (Original) The method of Claim 9, wherein said decomposition comprises matrix inversion.

12. (Original) The method of Claim 9, wherein said decomposition comprises an LDM decomposition.

13. (Previously presented) The method of Claim 9, wherein at least one operation using said sub-blocks as a sub-matrix comprises running optimized decomposition software.

14. (Previously presented) The method of Claim 9, wherein said decomposition permits direct solution of a system of linear equations without further division by a pivot.

15. (Previously presented)The method of Claim 2, further comprising: generating said interaction matrix from a first matrix, wherein said interaction matrix is relatively more sparse than said first matrix, and wherein the generation of said interaction matrix uses numerical interaction data.

16. (Previously presented) The method of Claim 15, wherein said using said interaction matrix comprises reducing a rank.

17. (Previously presented) The method of Claim 9, wherein said generating a block sparse matrix comprises using a matrix of disturbances.

18. (Previously presented) The method of Claim 17, wherein a first block of said more than one substantially sparse blocks is generated at least in part by reducing a rank of a matrix of disturbances.

19. (Previously presented) The method of Claim 18, wherein said first block contains interactions not described by said matrix of disturbances.

20. (Previously presented) The method of Claim 19, wherein one or more interactions described in said first block are described by said matrix of disturbances.

21. (Currently Amended) A method of data compression, comprising:

partitioning a first set of basis functions into groups, each group corresponding to a region, each basis function corresponding to an unknown in a system of equations, each of said basis functions corresponding to an original source;

selecting a plurality of spherical angles;

calculating a far-field disturbance produced by each of said basis functions in a first group for each of said spherical angles to produce a matrix of transmitted disturbances;

using a computing system, reducing a rank of said matrix of transmitted disturbances to yield a second set of basis functions, said second set of basis functions corresponding to composite sources, each of said composite sources comprising a linear combination of one or more of said original basis functions;

transforming ~~said~~ a system of linear equations to use said composite sources;

identifying a plurality of sub-matrices in said transformed system of linear equations;

operating on said plurality of sub-matrices to compute a decomposition, and wherein said decomposition is substantially comprised of second sub-matrices, each of said second sub-matrices corresponding to composite sources produced by reducing a rank of a first matrix of transmitted disturbances; and

using said decomposition to solve said transformed system of linear equations.

22. (Previously presented) A method of compressed solution of a system of linear equations comprising:

partitioning a first set of basis functions into groups, each group corresponding to a region, each basis function corresponding to one unknown in a system of linear equations, each of said basis functions corresponding to an original source;

calculating a plurality of far-field disturbances produced by each of said basis functions in a first group to produce a plurality of transmitted disturbances;

on a computing system, using said plurality of far-field disturbances to yield a second set of basis functions, said second set of basis functions corresponding to composite sources, each of said composite sources comprising a linear combination of one or more of said original basis functions; transforming said interaction data to produce a second system of linear equations using said composite sources, wherein a portion of said second system of linear equations is compressed relative to said system of linear equations, said a portion using said composite sources, and wherein said plurality of far-field disturbances is partially described by said interaction data;

operating on said transformed system of linear equations to compute a factorization wherein said factorization is compressed relative to said system of linear equations; and

using said factorization to solve said system of linear equations.

23. (Previously presented) A method, comprising:

identifying a system of equations described by interaction data;

obtaining a plurality of far-field disturbances; and

using a computer to compute a decomposition of said interaction data wherein a sub-matrix of said decomposition is compressed, the compression of said sub-matrix is computed using only said plurality of disturbances, wherein a portion of said compressed sub-matrix is itself compressed and said plurality of disturbances do not describe interactions described by said portion.

24. (Previously presented) The method of Claim 23, further comprising using said decomposition to compute a solution of said system of equations and wherein the step of using said plurality of disturbances comprises reducing a rank of a matrix of disturbances.